made experiments to ascertain the rate of corrosion of arsenical steel. He had submerged wires in a 2 per cent. solution of salammoniac, had placed others in fresh water, and still another sample to a pile of the wharf at the Middlesbrough Ironworks in such a position as to be alternately covered and exposed as the tide ebbed and flowed. The conclusions arrived at were that arsenical steel is not more liable to corrosion than the same material without arsenical addition; in fact, oxidation is retarded by the presence of small quantities of arsenic.

It is in steel that is to be used in positions where it will require to be welded that arsenic appears most injurious, for that process is rendered more difficult by even very small quantities of arsenic; so that, as Mr. Stead says, when welding material is required, arsenic should be most carefully avoided. In regard to electrical conductivity, too, arsenic is injurious, for the value of the material in this respect is materially reduced by even small quantities of arsenic. A quantity equal to 0·25 per cent. diminishes the conductivity by about 15 per cent.

The paper concludes with an appendix in which the author gives a method he has worked out in detail for determining the arsenic in iron ores, in steel, and in pig iron. It has been the general practice to precipitate the arsenic as sulphide or hydric sulphide from the distillate, and either weigh the pure sulphide after drying at 212° F. or to oxidise it in bromine and hydrochloric acid, and then precipitate the arsenic acid with ammonia and magnesia solution, and weigh the precipitate produced. This process, although accurate, is tedious and takes at least twenty-four hours to complete. Mr. Stead has found that if the distillation is conducted in a special manner the whole of the arsenic may be obtained in the distillate, unaccompanied with any traces of chloride of iron, and that if the hydrochloric acid is nearly neutralised with ammonia and finally completely neutralised with acid carbonate of soda, the arsenic can be determined volumetrically with a standard solution of iodine, using starch solution as an indicator.

Emil Fischer proposed the process of distillation with ferrous chloride and titration of the distillate with iodine solution; but, as the details are not given in "Crookes' Select Methods," Mr. Stead had to work them out for himself. These he gives in full in his paper, to which we must refer our readers, as it would take too much space to describe the process in full. Mr. Stead says that a more simple and accurate device for the determination of small quantities of arsenic it would, he thinks, be impossible to conceive.

The discussion of this paper, although of an interesting nature, did not produce any new facts of importance. The majority of those who spoke were either steel makers or those interested in the production of steel, and they naturally congratulated themselves on the conversion of a long-supposed enemy into a neutral, if not into an ally. It should be remembered, however, that the meeting consisted chiefly of persons only too anxious to reduce the difficulty and cost of steel making; and not likely to accept any explanations tending to that end in a captious spirit. No one is likely to question the scientific accuracy or *bona fides* of so eminent and conscientious an observer and experimentalist as Mr. Stead, yet there may be something to say on the other side. This appears more likely from the remarks of the one user of steel who spoke—Mr. Wigham, the manager of a wire-drawing firm—who had made a report to Mr. Stead, which was quoted in the paper. It should be remembered, also, that Mr Stead himself says that further experiments are necessary.

The only remaining paper that was read was Mr. Scott's contribution on the Iron Mines of Elba. This was not discussed.

The autumn meeting of the Institute will take place in Birmingham, commencing Tuesday, August 12.

THE SCHORLEMMER MEMORIAL LABORATORY.

AN interesting ceremony took place at the Owens College, Manchester, a few days ago, when Dr. Ludwig Mond formally opened the Schorlemmer Laboratory for Organic Chemistry, together with a large laboratory for medical students and a room for the preparation and storage of reagents. It may be remembered that, after the death of Prof. Schorlemmer, his friends and pupils, under the lead of Sir H. E. Roscoe, late professor of chemistry at the College, took steps with a view to fittingly commemorate his services to the College and to the advancement of organic chemistry. It was generally felt that the best memorial would be the erection of a laboratory for organic chemistry, to be called after his name, and a subscription list was accordingly opened. The appeal, which was generously headed by Dr. Mond, was so well responded to, both in this country and in Germany, that in a short time a sum of £2500 was subscribed. Meantime the Council of the College had to take into serious consideration the rapid growth of the chemical department. Originally designed for 100 students, the laboratories had for several years been overcrowded, and the private rooms built for research work had to be given up for the general instruction of the students. The number of the students in the chemical laboratories has steadily increased during the past five years, and, in view of this increase, the Council became convinced of the necessity of extending the chemical department. They accordingly accepted the fund raised by the Schorlemmer Memorial Committee, and instructed Mr. Alfred Waterhouse to prepare plans for a "Schorlemmer" Organic Laboratory, and for a new laboratory for elementary students, on a plot of land adjoining the present laboratories acquired by the College for the purpose of their extension. The Schorlemmer Laboratory, designed by Mr. Waterhouse, is at the end of the main corridor in the old chemical building. It measures sixty feet by thirty feet, and has an arched roof thirty feet high. The laboratory is designed to accommodate a professor, two demonstrators, and thirty-six students. It is fitted in the most complete manner with every requisite for the important work which is to be carried on within it, and in some particulars is arranged after the plan of the Munich organic laboratories. The lower laboratory is designed for forty-five students. The fittings are similar to those in the old laboratories designed by Sir Henry Roscoe. The total cost of the new building was £4800.

A full report of the opening ceremony is given in the *Manchester Guardian*, to which source we are indebted for the following condensed account:—

In connection with the inaugural proceedings, a large and representative company gathered in the Chemical Theatre of the College. Messages regretting inability to attend, and wishing prosperity to the laboratory, were received from a number of eminent chemists. Prof. H. B. Dixon referred to the esteem in which Schorlemmer's name was held, and expressed, on behalf of his colleagues and himself, their admiration of the life and character of the man to whose memory the laboratory had been erected.

Sir H. E. Roscoe sketched Schorlemmer's life, and, in the course of his address, said:—Schorlemmer added another name to the list of distinguished foreigners who had found a home in these islands. Never again could it be said that England failed to recognise and appreciate the value of the services of those who sought her shores. The names of Herschel, of Hofmann, of Max Müller, and, lastly, of Schorlemmer indicated that we are not slow to give honour to those who were once strangers in the land, but who had made themselves members of our national family. They might have good hopes that the time would soon come when the leaders in chemical industry would appreciate the necessity of a thorough scientific training, as had long been the case in Germany; and that as Giessen was, under Liebig, the means of raising the standard of chemical education throughout the Fatherland, so the chemical department of Owens College might, under the direction of Prof. Dixon and Prof. Perkin, the director of the new laboratory, be pointed out as the institution in England which had done the same for this great empire.

Dr. Ludwig Mond next addressed the meeting. He remarked that the opening of the first laboratory solely devoted to the study of organic chemistry, at the only University in England which could boast of a professor of that science, was a distinct step forward in the development of science in this country. He considered it a great step in advance to have a special laboratory and special professors appointed for the study of the chemistry of carbon, because the subject-matter of chemistry now covered so vast a domain, and was increasing at such an immense rate, that for any one desiring to further contribute to it, it had become a necessity, after mastering the main facts of the science, to give his attention specially to the details of one or other part of it. While it was true that carbon was only one out of many elements, it possessed such very special properties that the multitude of its compounds probably outnumbered those of all the rest of the elements together, and it had the unique interest that all the innumerable substances that were found in plants and animals, which built up their tissues, and by their constant changes produced the phenomenon we called life, were all

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compounds of carbon. It was for this reason that they called the chemistry of these compounds organic chemistry, and it was very natural that that branch of their science should be nearer to their hearts than any other branch. But there was another and stronger reason for having special laboratories of organic chemistry. The methods of investigation and the way of analysing organic compounds differed considerably from those applied to inorganic chemistry. In the latter, if we had ascertained by an accurate analysis of a pure substance its percentage composition, that, together with the determination of a few simple physical properties, was usually sufficient to give us a perfect insight into its chemical composition and behaviour. The laboratory methods required for that study were simple and most of them well known, so that they could be acquired by sufficient experience. In organic compounds the matter was very different. The percentage composition and the physical properties told them very little of their chemical individuality and behaviour. Many substances of exactly the same percentage composition possessed widely different qualities, which were not explained by their physical properties. They must find out how these compounds, many of which were very complex, were built up. They had to unravel the structure of those substances to attain their end, which in chemical investigation always meant to give an explanation of all the various properties of a substance through its chemical constitution. To ascertain its structure they had to break the organic substance down by degrees, to take it gradually to pieces; and even that was not enough, but to make sure of the actual arrangement of those pieces in the substance they had to put them together again, to rebuild the substance from its proximate constituents, and only after having accomplished that could they consider that they knew its constitution. The methods employed in that work were entirely different from those of ordinary analysis. They were very manifold. The investigator had to make his own choice which of them to apply in any individual case, and wherever he broke new ground and undertook the study of a new series of compounds, he had to discover and work out new methods before he could achieve success. It was evident that a student who aimed at qualifying himself for such high-class work should enjoy special facilities, and should, after having gone through a regular course of analytical chemistry, have a chance of prosecuting special organic work in a laboratory fitted specially for it, and where he was undisturbed by the army of beginners who thronged an analytical laboratory. And there he might point out that in his opinion the reason why this country had not advanced in organic chemistry as fast as other countries, the reason why Hofmann's prediction in his report on the Exhibition of 1862 that "England will be unquestionably at no distant date the greatest colour-producing country in the world," had not been fulfilled, and that Germany had almost entirely taken this industry out of her hands, although it was inaugurated by an Englishman (Dr. W. H. Perkin), had been that so few English students of chemistry had devoted sufficient time to the prosecution of their studies. It was evident, therefore, in order to attain the necessary experience and certainty in carrying out original investigation in organic chemistry, that four to five years of close study and attention, under the leadership of a competent professor, were a necessity; and for carrying on successfully the manufacture of artificial colours it was indispensable that the chemist should be able to carry out independent original research because new colours had year after year to be discovered and manufactured, and the processes for their production had to be constantly improved in order to compete successfully with rival manufacturers. The success of an industrial enterprise depended not, indeed, upon the workman, not the foreman, as so many people in this country still believe, but upon the leading mind who directed the manufactory, who had a thorough grasp of scientific principles and had been trained to habits of scientific thought. He agreed that it was desirable to cultivate physical chemistry and inorganic chemistry much more than had been done, and he was very glad that the great supremacy which organic chemistry had enjoyed—more particularly in Germany, the home of chemistry—was now being contested by other and equally important branches of the science. But great, and very great, as had been the progress of organic chemistry, it had greater and more important problems still to solve; and in this country, which had given birth to so many of the most important steps in advance of that science, it had not received that amount of general attention which it had deserved in the past, and which it still deserved in the future. He therefore specially and heartily welcomed the opening of the first laboratory exclusively devoted to it in England. Prof. Schorlemmer, in his excellent and most suggestive little work "On the Rise and Development of Organic Chemistry," after giving a lucid review of the steps by which the great edifice of that science had been built up, gave in his concluding remarks a perspective of the problems still to be solved wide enough for the most expansive imagination of any searcher after truth. If to-day we still could not make morphine, quinine, and similar bodies artificially, the time was near at hand. If we could not make quinine, we had already found a partial substitute in antipyrine, and its introduction into therapeutics had lowered the price of quinine considerably. Another important problem was the synthesis of the ingredients of our daily food, such as sugar, gum, and starch. Those bodies were nearly related to each other, for we could convert the two latter into different kinds of sugar, and sugars again into gums. That the synthesis of sugar was imminent had already been stated. But it was quite different with those important parts of our food which had been called the albuminous bodies. Kekulé, in discussing the scientific aims and achievements of chemistry, brought forward the idea that if ever chemists should succeed in obtaining albuminoid bodies artificially it would be in the state of living protoplasm, perhaps in the form of those structureless beings which Haeckel called the "Monera." All attempts hitherto made for the purpose of producing living matter artificially had failed. The enigma of life could only be solved by the synthesis of an albuminous compound. Prof. Fischer, in a lecture delivered not long ago in Berlin, also expressed himself full of confidence that the time would arrive when we might attack successfully even the problem of the constitution and synthesis of the albuminoids, and might thus approach the problem of the origin of life. Surely with such a prospect before them as the ultimate result of the pursuit of organic chemistry, no amount of work, no amount of thought, no amount of time and trouble devoted to that study would be too much if it was well employed in leading successfully to the great end in view, although the goal might not be reached for generations to come.

The company afterwards adjourned to the new laboratory, which was declared open by Dr. Mond.

THE MIGRATIONS OF THE LEMMING.

UNDER the title "Myodes Lemmus, its Habits and Migrations in Norway," Prof. R. Collett, of Christiania, gives a valuable account of his researches into the habits and migrations of that interesting little rodent, the lemming, which has become so notorious on account of its periodic wanderings in vast hordes down the Scandinavian valleys. Prof. Collett finds the earliest notice of the lemming in an old Norse manuscript dating from the latter end of the thirteenth century, and reproduces a curious and striking woodcut from the great history of Olaus Magnus (1555), in which is graphically figured the descent of the lemmings from the clouds according to the prevalent belief. But the most valuable parts of the memoir are those which depend upon the author's personal knowledge of the lemming. The nature and habits of the lemming are clearly described, and much light is thrown upon the causes which from time to time lead such vast numbers of these animals to leave their native uplands and to begin their suicidal wanderings. The migrations seem to be directly due to over-population. In certain years, termed by the writer "prolific years," an abnormal fecundity is exhibited by the lemming; this phenomenon is not, however, confined to this species, but is shown also in numerous families of mammals, birds, and insects. The consequences of this great multiplication in the case of the lemming are thus described by Prof. Collett. "The enormous multitudes require increased space, and the individuals, which, under normal conditions, have each an excessively large tract at their disposal, cannot, on account of their disposition, bear the unaccustomed proximity of the numerous neighbours. Involuntarily the individuals are pressed out to the sides until the edge of the mountain is reached. In a short time they enjoy themselves there, and the old individuals willingly breed in the upper regions of the forests, where, at other times, they are entirely wanting. New swarms, however, follow on; they could not return, but the journey proceeds onwards down the sides of the mountains, and when they once reach the valleys, they meet with localities which are quite foreign to them. They then continue blindly on, endeavouring to find a home corresponding to

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